HL7 Version 3: Benefits, Methodology, and Evolution Strategy

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Washington, DC

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The Change Paradox

It is change, continuing change, inevitable change, that is the dominant factor in society today. No sensible decision can be made any longer without taking into account not only the world as it is, but the world as it will be. . . .

Isaac Asimov (1920–92)

Most of us are about as eager to be changed as we were to be born, and go through our changes in a similar state of shock.

James Baldwin (1924–87)

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Bumper Sticker HL7 History

- Version 2.x
  - Don't let the perfect get in the way of the good
  - "Systems Agility"
- Version 3
  - Finer grained, more precise systems agility
  - Don't let the perfect get in the way of the better

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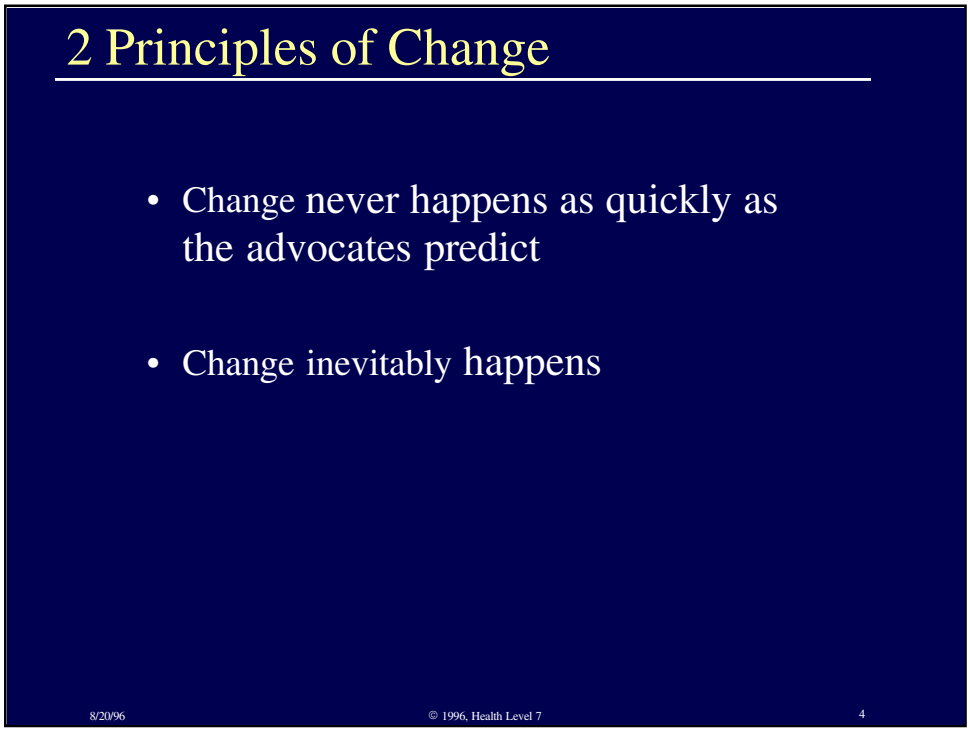

The real issue is trading off the costs and benefits of change.

The game of the strategic planning is finding the horses to ride, and accounting for slow evolution of legacy systems.

What's the Big Deal about Version 3?

- Substantial benefits
- **Not** a fully compatible upgrade
- Is the gain worth the pain?
- You tell us

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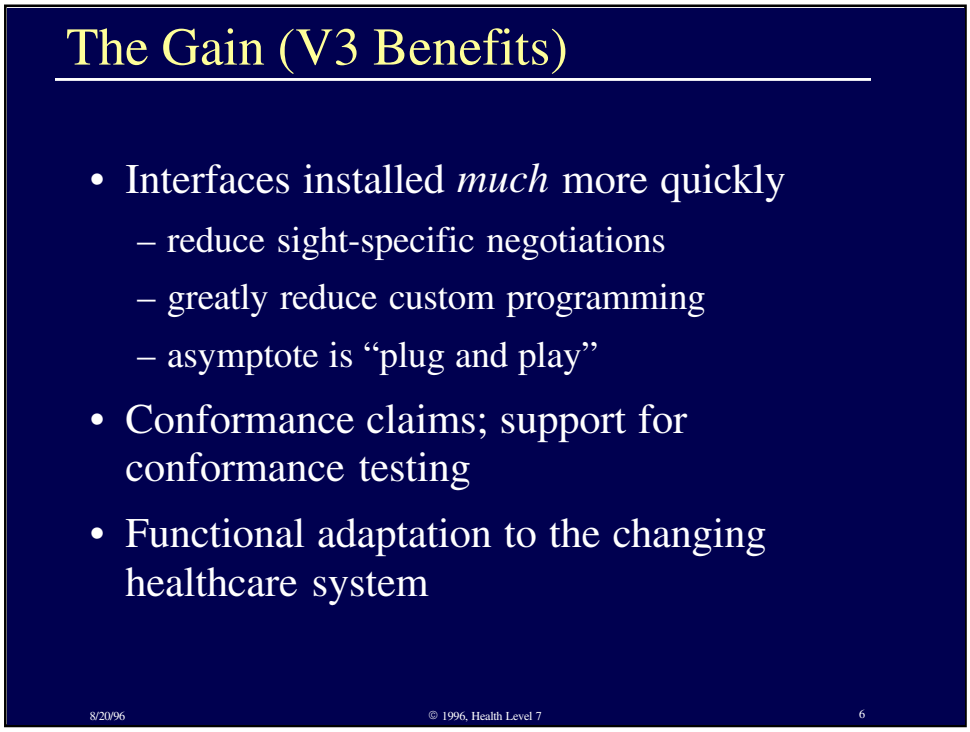


Goals

interfaces installed more quickly

reduced discovery of misunderstandings during testing or in production

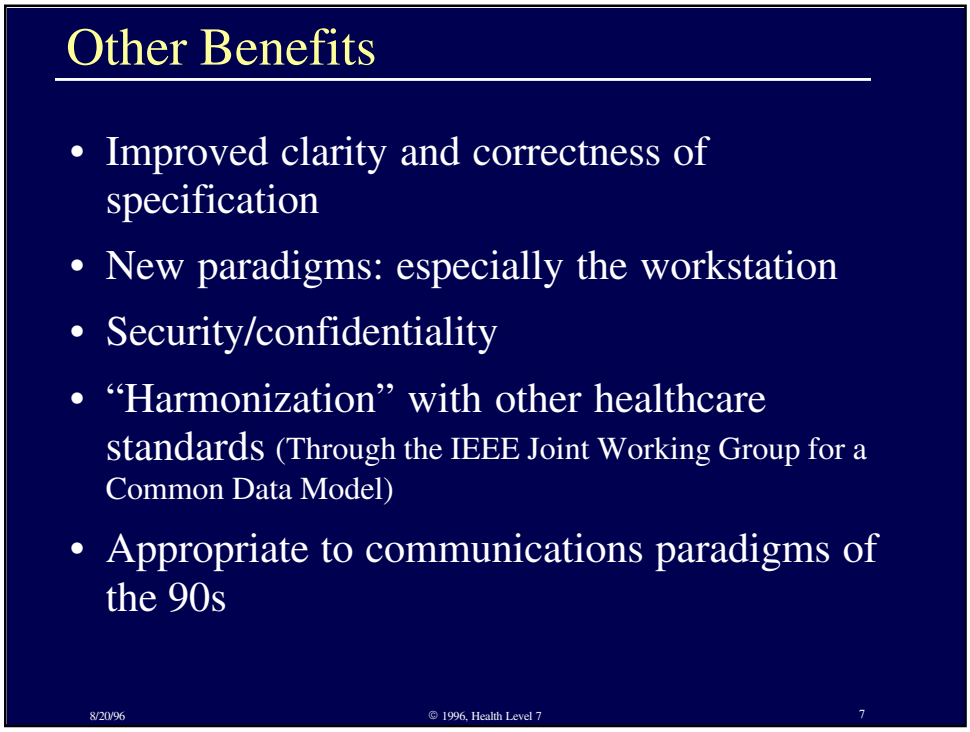
reduced time renegotiating communications portion of interface

"harmonization" with other healthcare standards

functional partition

transliterability

interoperation



New paradigms: object oriented analysis, distributed objects.

Achieving the Goals

- Data model
  - clarity
  - coordination with other standards
- More messages that are more specific: reduce or eliminate optionality
- Provide useful subsets and vocabulary for conformance claims
- More aggressive process management by the Technical Steering Committee
- More thorough review by QA

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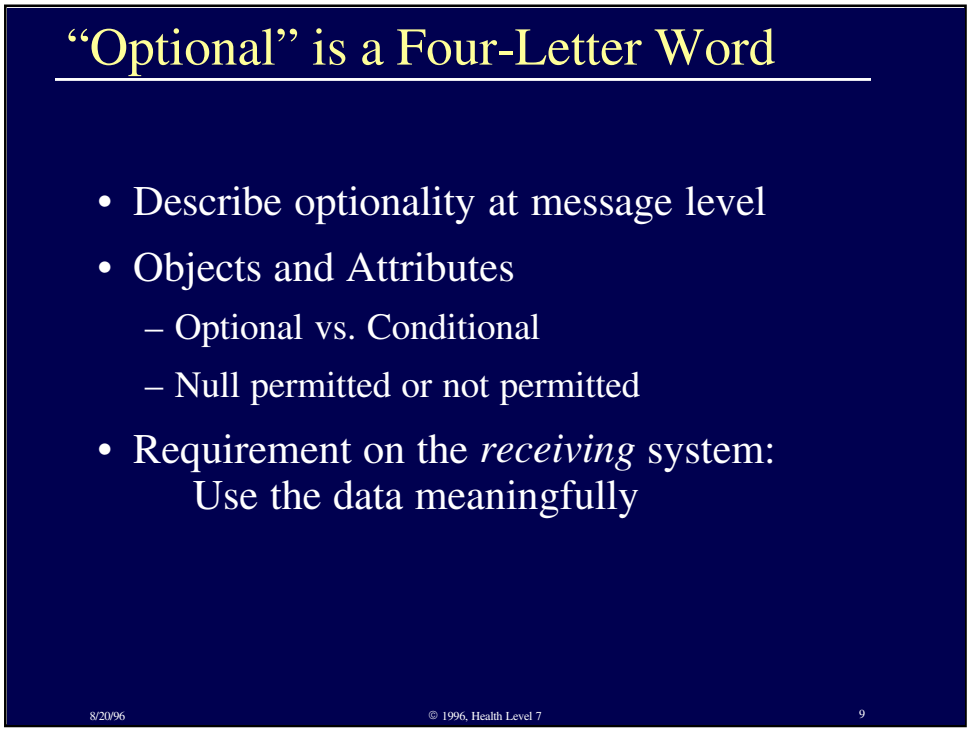
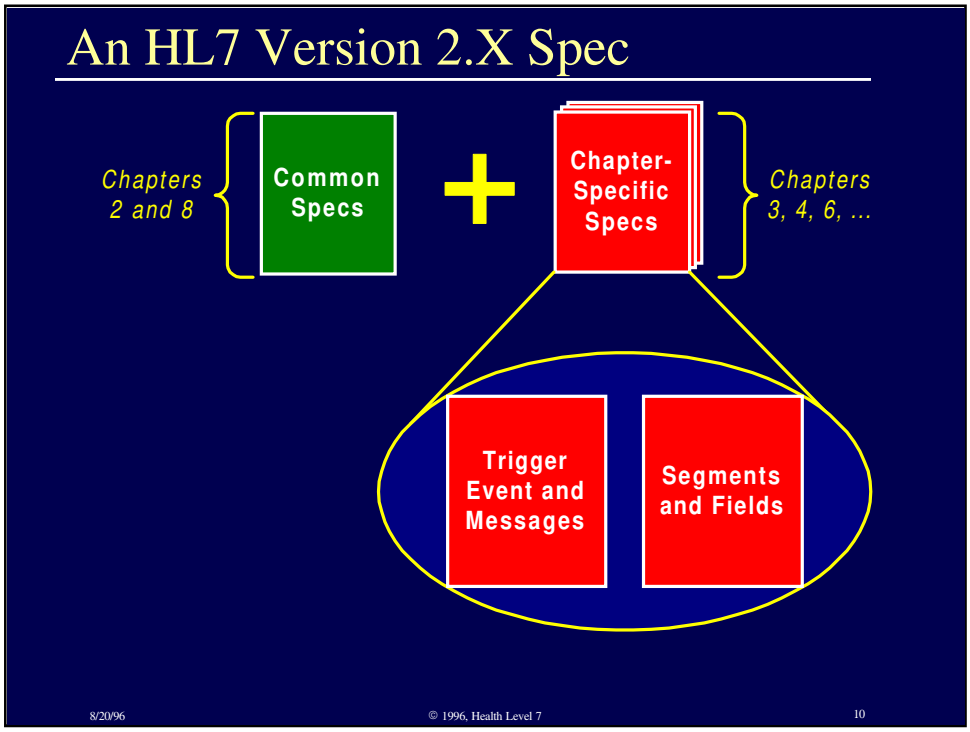


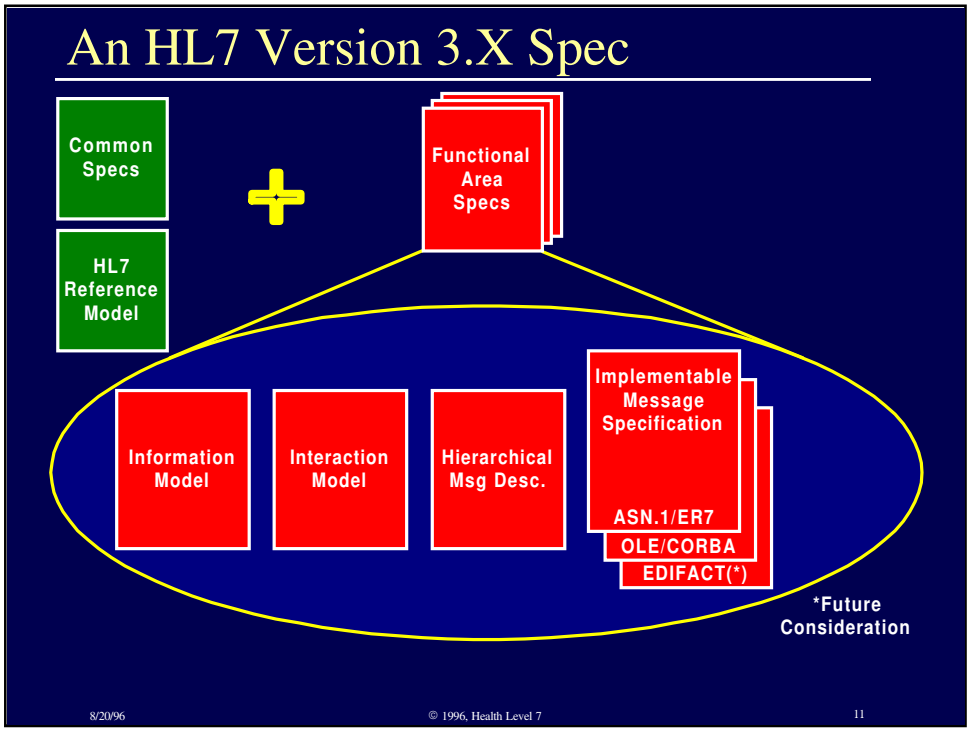
Current HL7 standards make almost every data field optional, since optionality is defined by segments and segments are re-used in multiple messages.

Version 3 will define optionality by trigger event. This does not necessarily eliminate optionality, but it does eliminate unintentional optionality.

"Conditional" is a more rigorous alternative to optionality. The presence of one data field is required or not allowed depending on the value of another field. For example "bed location" is required if visit type is "inpatient" or "day surgery."



This is the basic structure of the current HL7 specification. Contrast it with the structure of version 3, next slide.



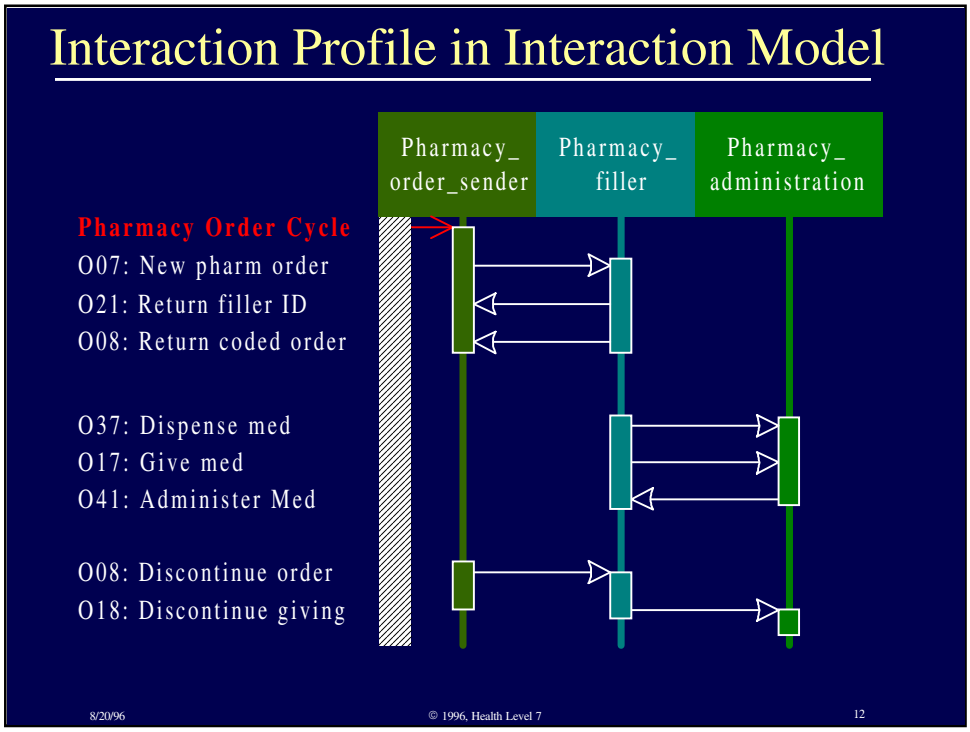
The HL7 **Reference Model** is a single object-oriented model of all the classes of data used in all HL7 messages, their attributes and interconnections. It also includes **use cases** that are used to document the context in which data is used and messages are sent. The HL7 Reference Model helps spec users understand what is meant be data fields, and ensues consistency among HL7 messages. It is also a basis for harmonization of the HL7 view of data with those of other healthcare Standards Development Organizations.

The **Information Model** is a strict subset of the HL7 Reference Model that makes it easier to perceive the data associated with a given chapter.

The **Interaction Model** relates use cases to application profiles, as described previously.

The **Hierarchical Message Description** is the meat of the specifications for a set of messages. It describes the data fields that will be sent for a given trigger event. Its tabular format is highly reminiscent of the Segment Tables in HL7 Version 2.X.

The combination of the HMD and the other chapter-specific specs fully defines the information content of HL7 messages and the rules for when they must be sent. These messages may be formatted in a modification of the HL7 version 2.2 syntax or they may be sent using CORBA or Microsoft OLE. The details specifications for these three formats are described in the **Implementable Message Specifications.**



The vertical lines represent an "interaction profile." In healthcare systems profiles might have names like "administrative data manager" or "order creator." Actual systems will be described as conforming to one or more of these roles.

The bold-face items in the left column represent "use cases" described below. The non-bold text represents trigger events/messages. The arrows that correspond to the trigger events represent a message going from one conformance role to another, possibly with the sane name.

An information system that wants to claim conformance to HL7 Version 3 will be required to send and receive all the messages associated with its profile.

Conformance Claim

- Describes a *role* to which a system may claim conformance
- Fine-grained abstraction; every system will claim several roles
- *Not* standardizing system function, only messaging roles
- Basis for contractual agreement
- Potential basis for conformance testing

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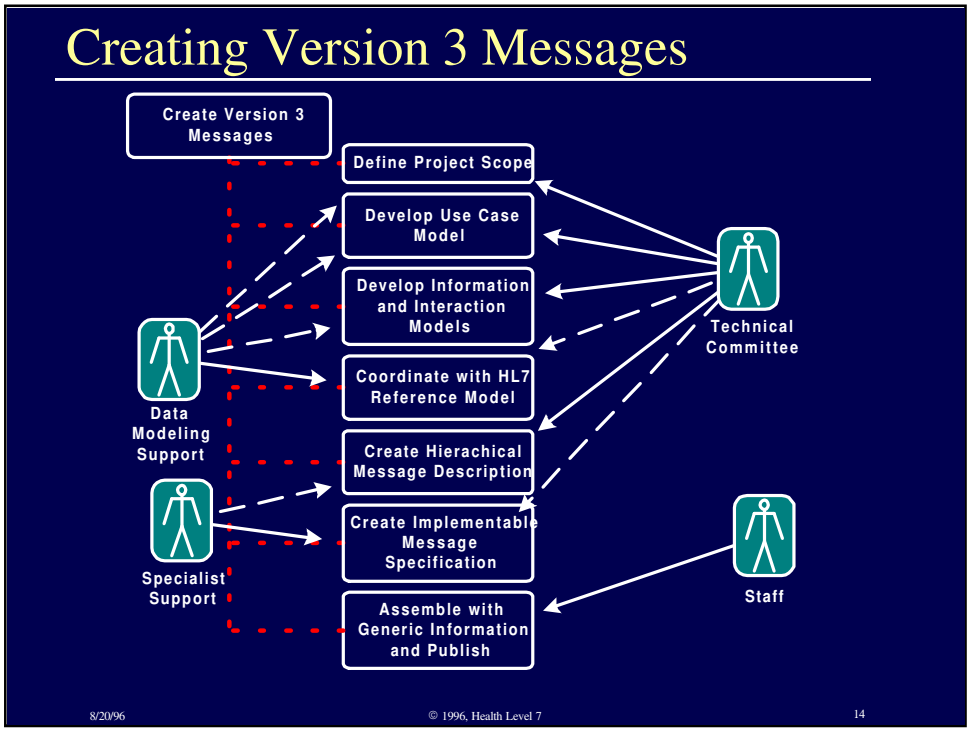
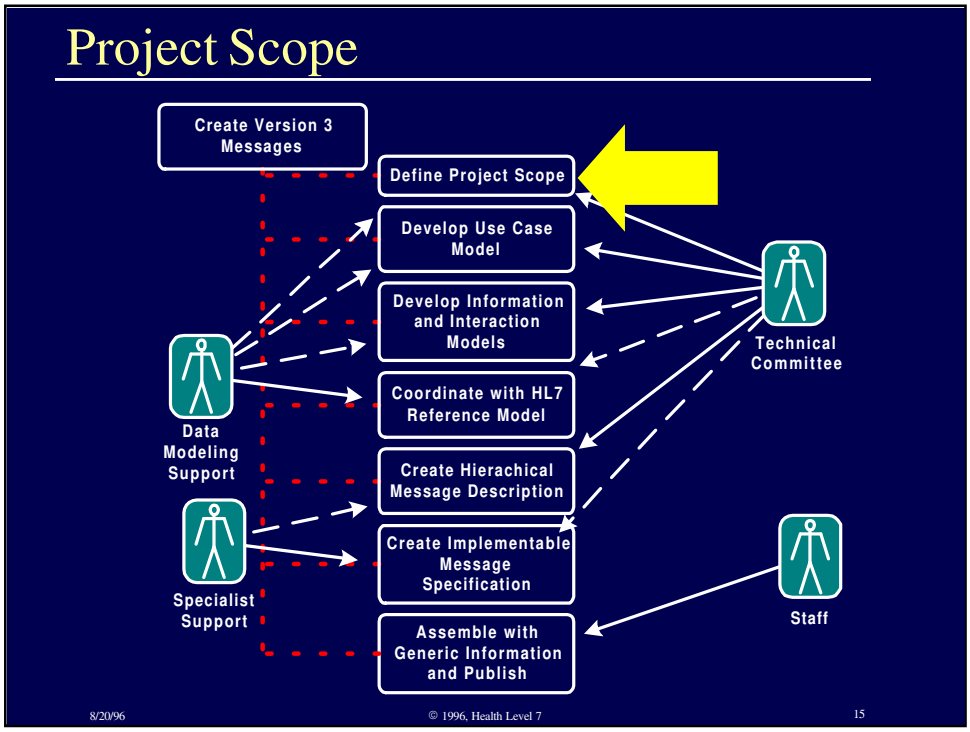


This diagram describes the various roles and the steps they participate in when creating a chapter. The format of the diagram is that chosen by HL7 and the Joint Working Group for a Common Data Model to represent use cases.



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Project Scope

- Defines boundaries of project: functional need for messages
- Will cover a group of related transactions
- Approved by the Technical Steering Committee
- Described in Minutes and HL7 Newsletter

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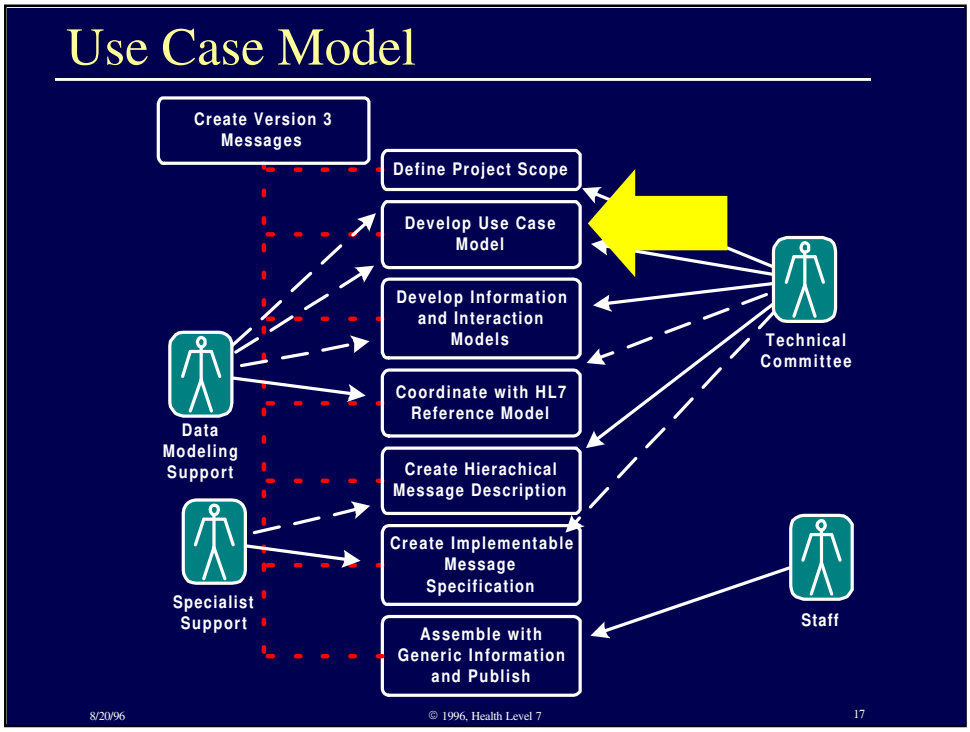

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Use Case: Structured Scenario

- Use Case
  - A textual description of specific situations within the healthcare environment in which communication between healthcare entities is needed. The use case describes the actors who are important within the project scope, and the activities that those actors carry out. Use cases fill out, and more fully define the functional requirements indicated by the Project Scope.
- Structured into levels
- Actor
  - Discovered in the process of developing use cases

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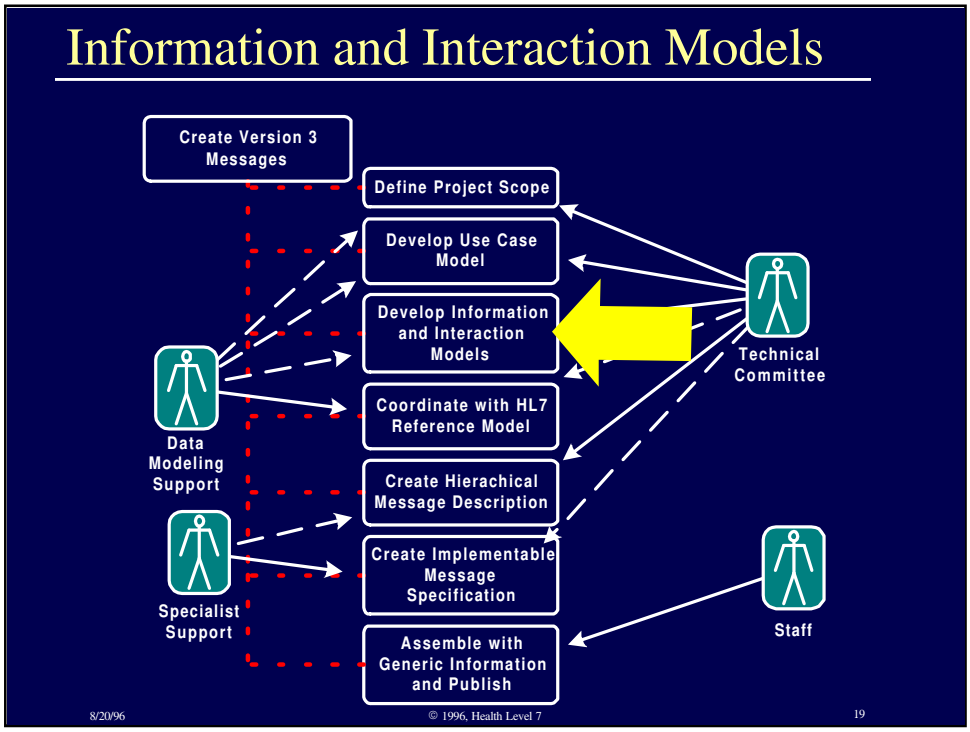

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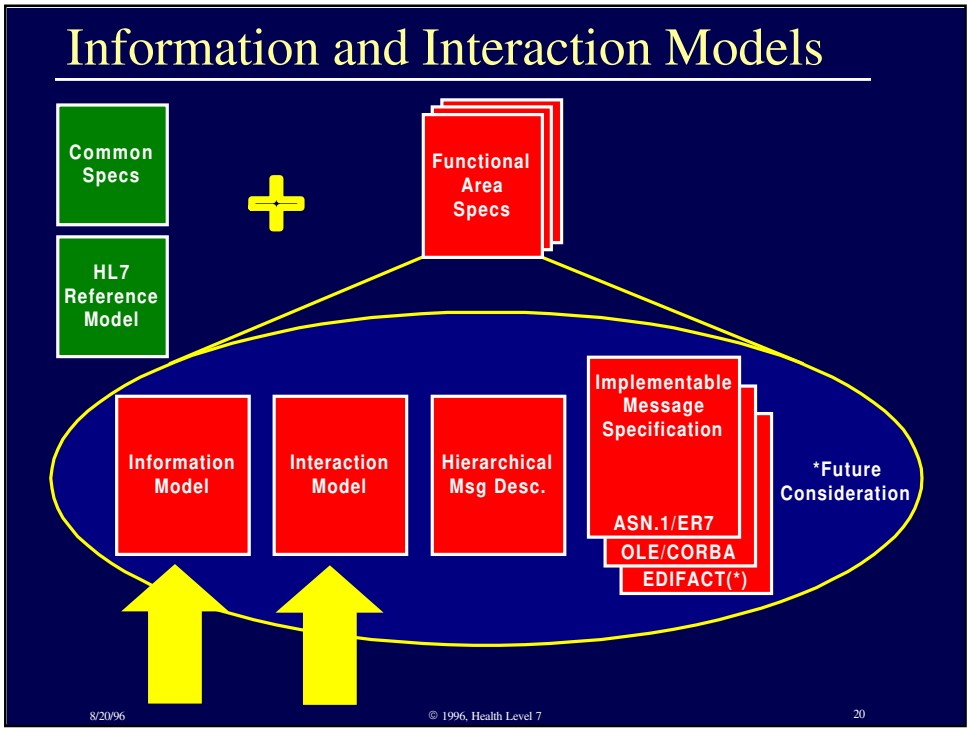
Information and Interaction Models
Common Specs
HL7 Reference Model
Functional Area Specs
Information Model
Interaction Model
Hierarchical Msg Desc.
Implementable Message Specification
ASN.1/ER7
OLE/CORBA
EDIFACT(*)
*Future Consideration
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Domain Information Model

- Definition
  - Provides a well expressed definition of the information for a project scope.
  - Project information model draws from the HL7 Reference model, and adds to it.

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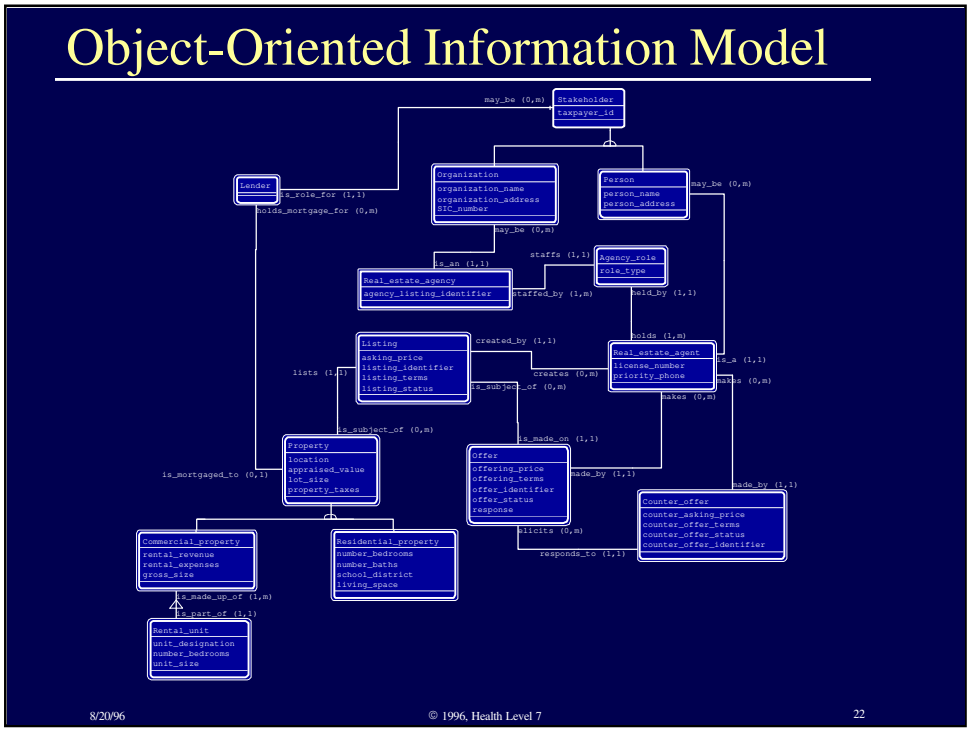

If you can read this, you will noticeit is a model of real estate classes used for listing properties or placing offers. This is the “toy model” used for teaching HL7. Using a healthcare model wastes a great deal of time in discussions of whether the exemplar model truly represents healthcare.

Creating a Domain Information Model

- Draw from HL7 Reference Model
- Review use cases to find additional classes, attributes and connections
- For selected classes develop *state transition* diagrams
- Develop Interaction Model
- Harmonize with Reference Model

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State Analysis

- **Based on information model**
  - Selected objects are described as having "states"
    - e.g., a lab test might be 'ordered', 'acknowledged', 'partially complete', 'final', 'revised', 'canceled'
  - State *transitions* restricted; form sources of trigger events
- **Benefits**
  - better analysis
  - disambiguate or rule out nonsense transitions

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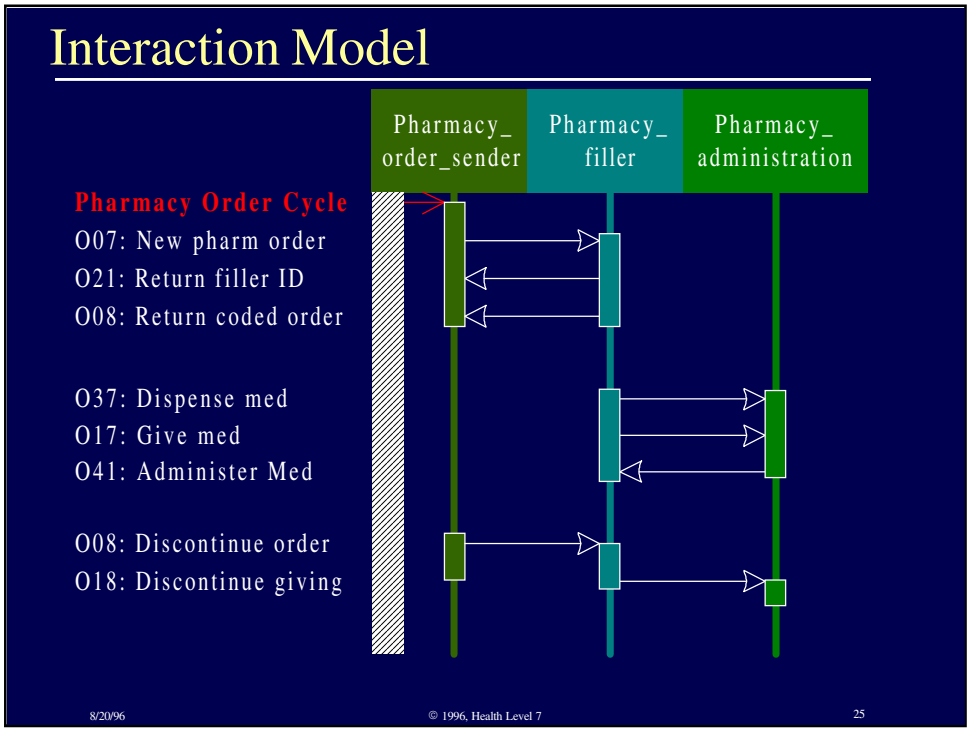


–Use Case Reference--may be higher level UC

–Trigger Events

–Senders

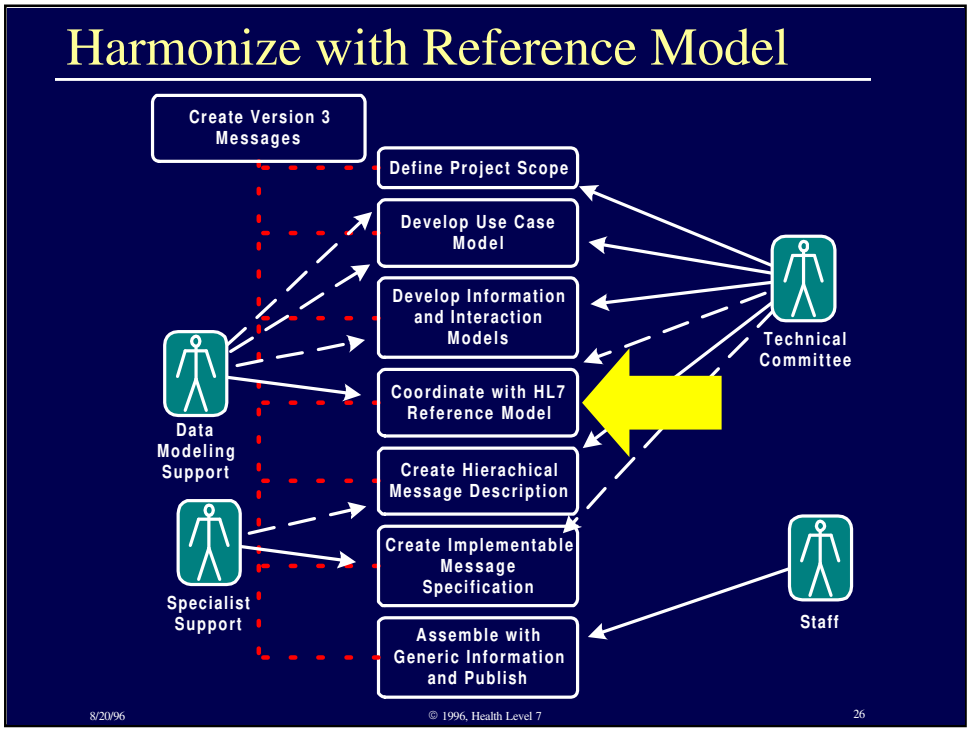
–Event Dependency

- In some cases, a trigger event is not valid for an application unless a specific interaction has been received, or an object that the interaction refers to is in the appropriate state.

–Receivers

–Receiver Responsibilities

- In some cases, receipt of an interaction implies a specific responsibility for the receiver of an interaction. Document the responsibility for each interaction. These responsibilities will become important when conformance claims are defined.


Harmonize with Reference Model
Create Version 3 Messages
Define Project Scope
Develop Use Case Model
Develop Information and Interaction Models
Coordinate with HL7 Reference Model
Create Hierachical Message Description
Create Implementable Message Specification
Assemble with Generic Information and Publish
Technical Committee
Data Modeling Support
Specialist Support
Staff
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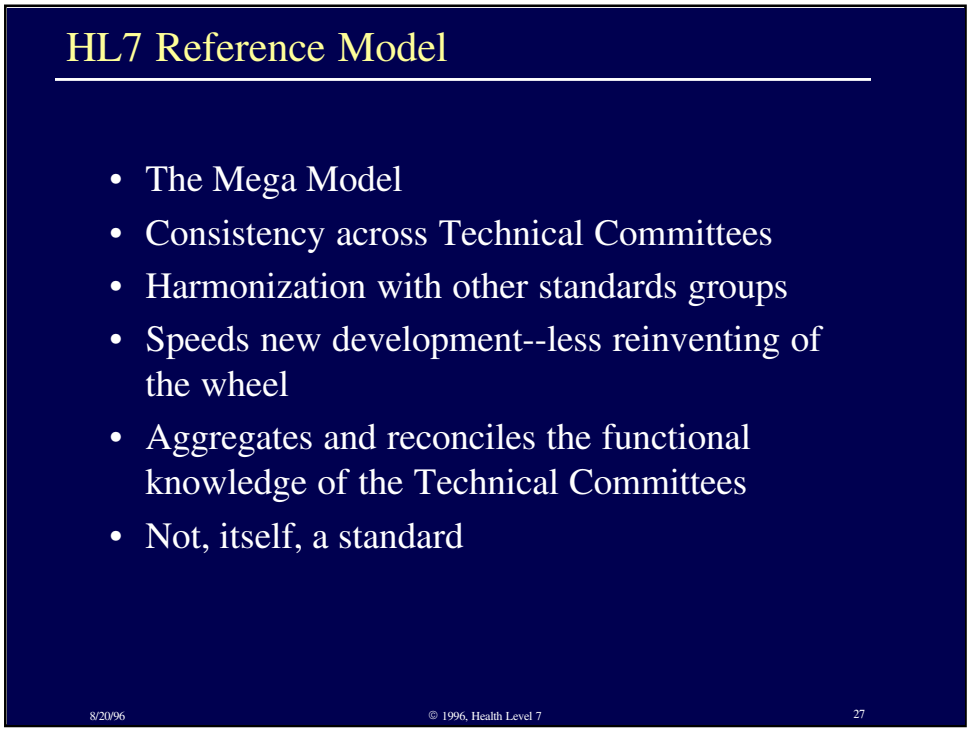

As a unitary structure, it “belongs” to the HL7 Working Group as a whole

"Starter" Reference Inf. Model

- Call for Models
- Aggregation, reconciliation
- *Draft* Starter Reference Information Model
  - Complete in Fall
  - Review with Tech Committee reps
- Final "Starter" model is just a start
- ***Grows*** through Tech Committee Domain Information Models

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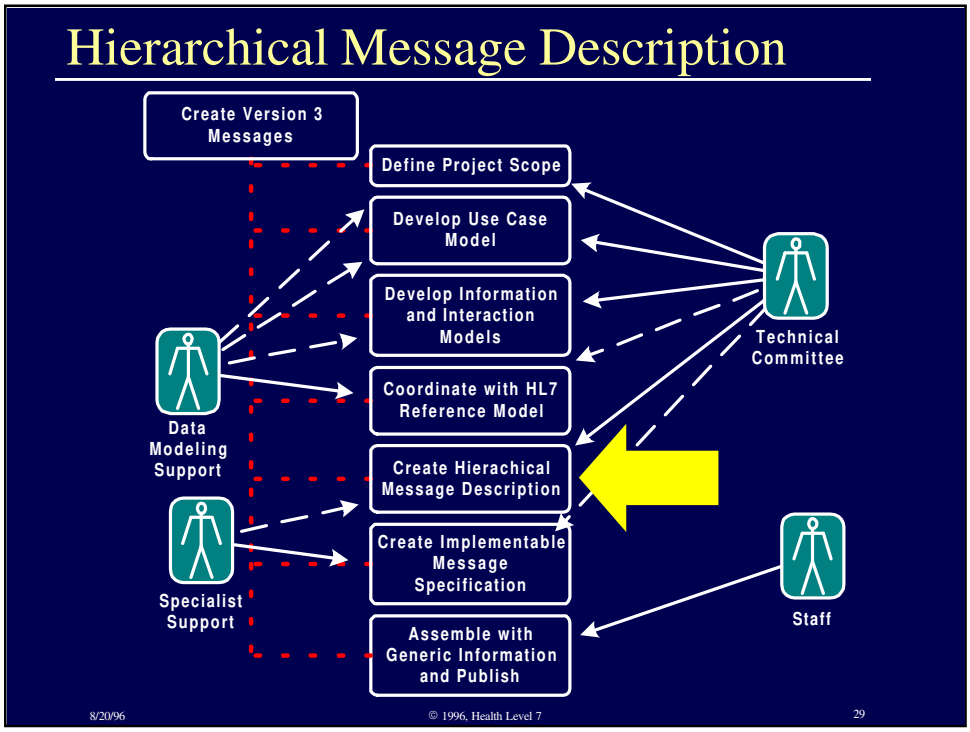
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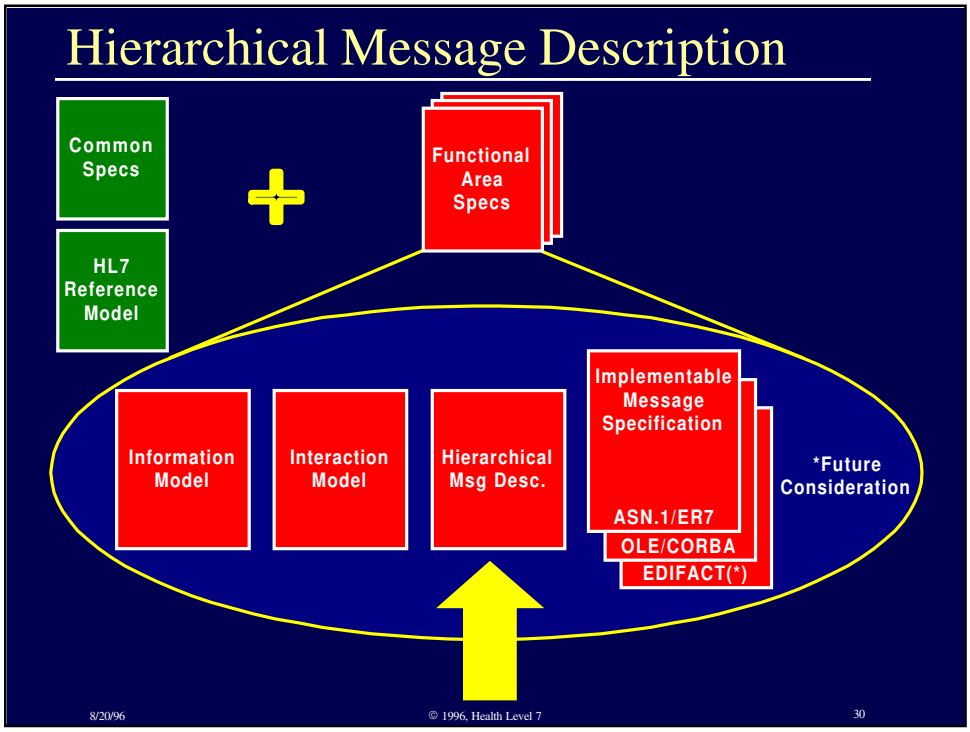
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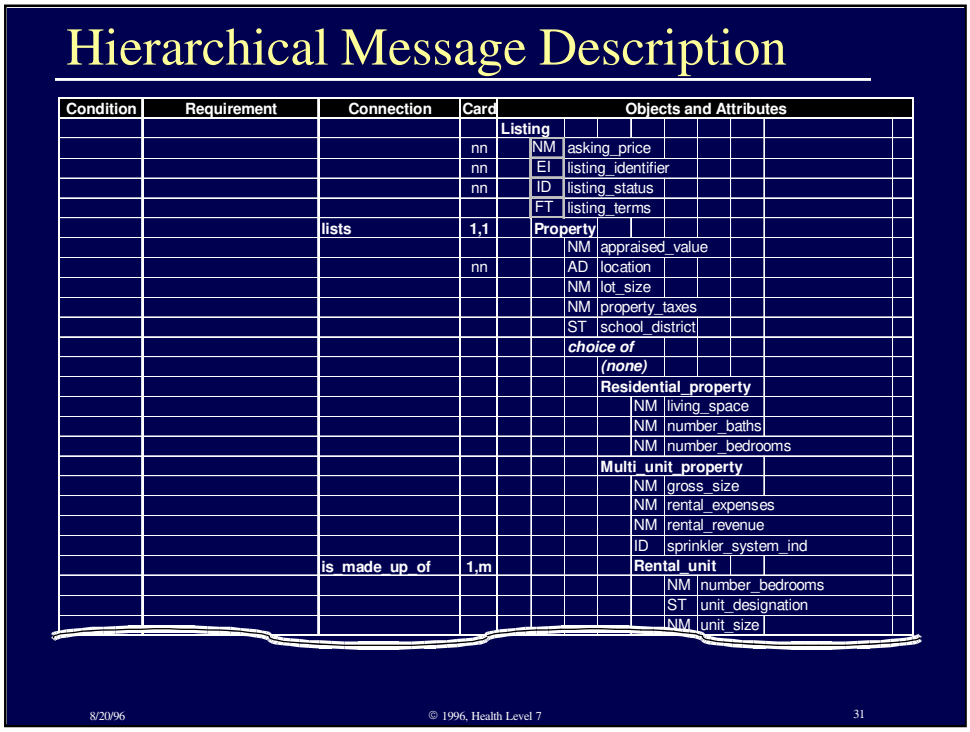
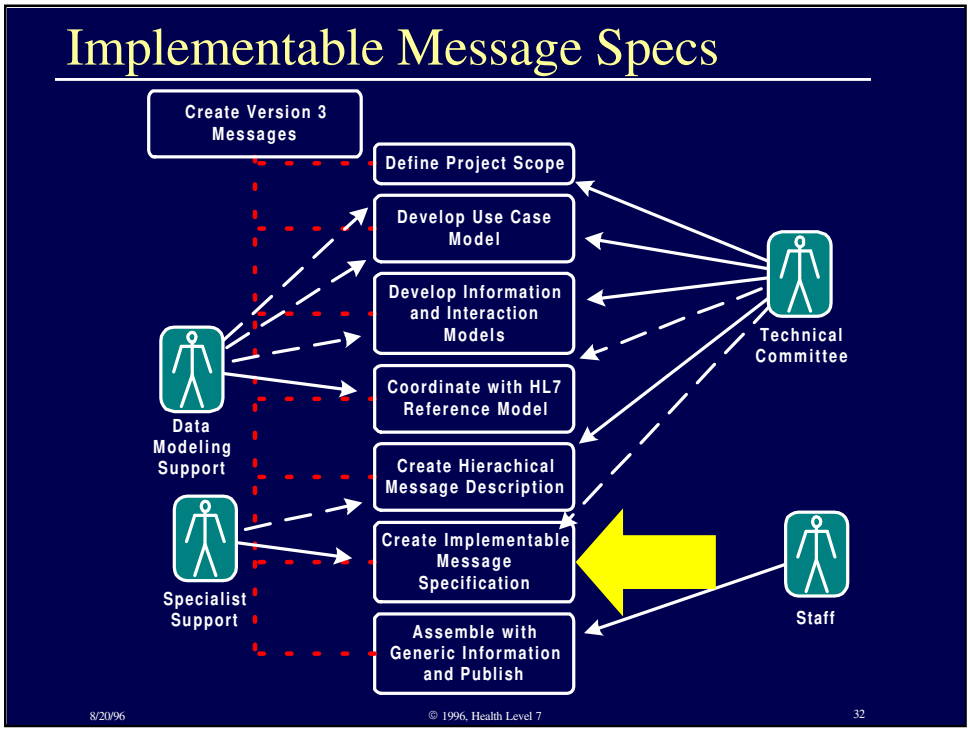


- Describes every attribute in message
- Indicates whether attribute may be null
- "Conditional: and "Required" columns may be used for "conditional" presence of field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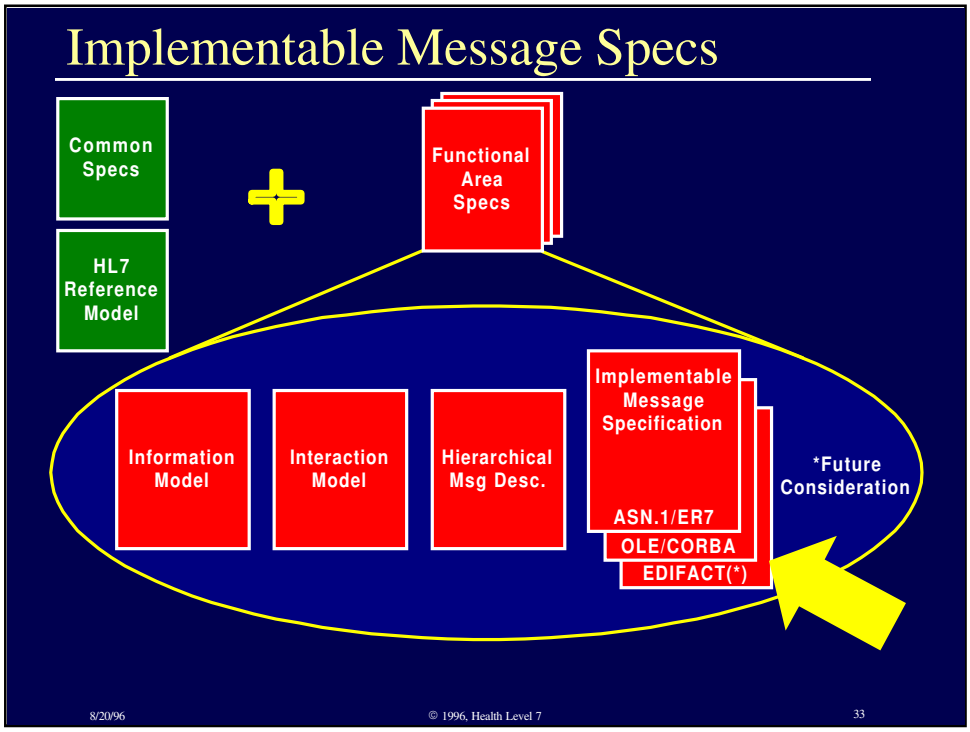
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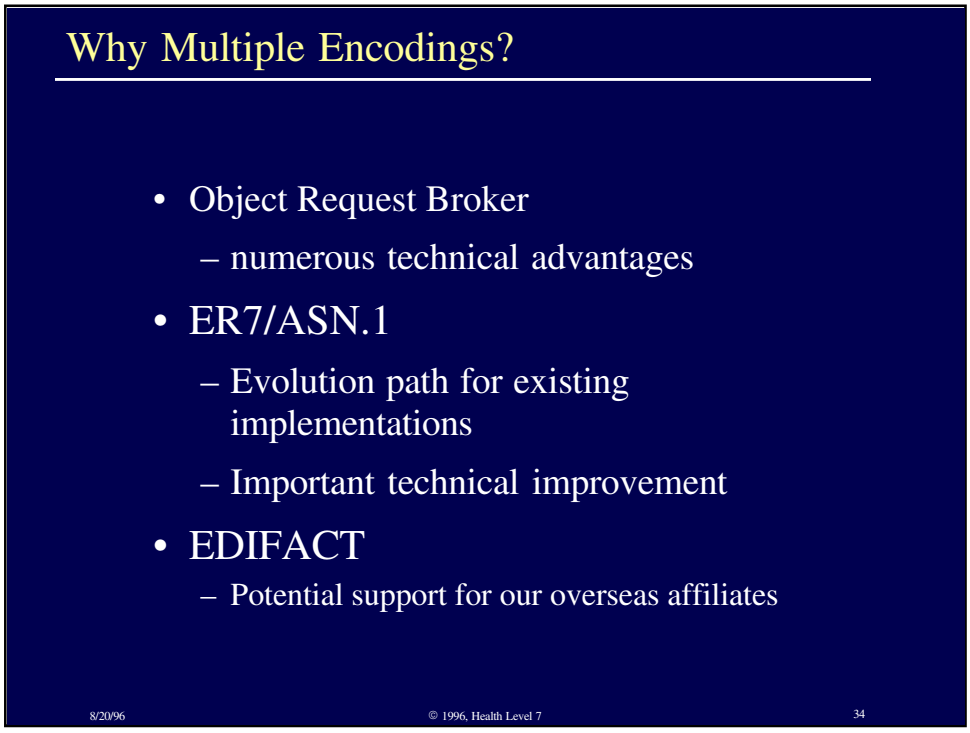


•Object Request Broker messages have numerous advantages:

–Eliminates requirement for “lower layer protocols” (addressing, circuit making, recovery paradigms, acknowledgments)

–Handles encoding/decoding (fewer bugs, faster programming)

–Handles inter-OS compatibility

•ER7/ASN.1

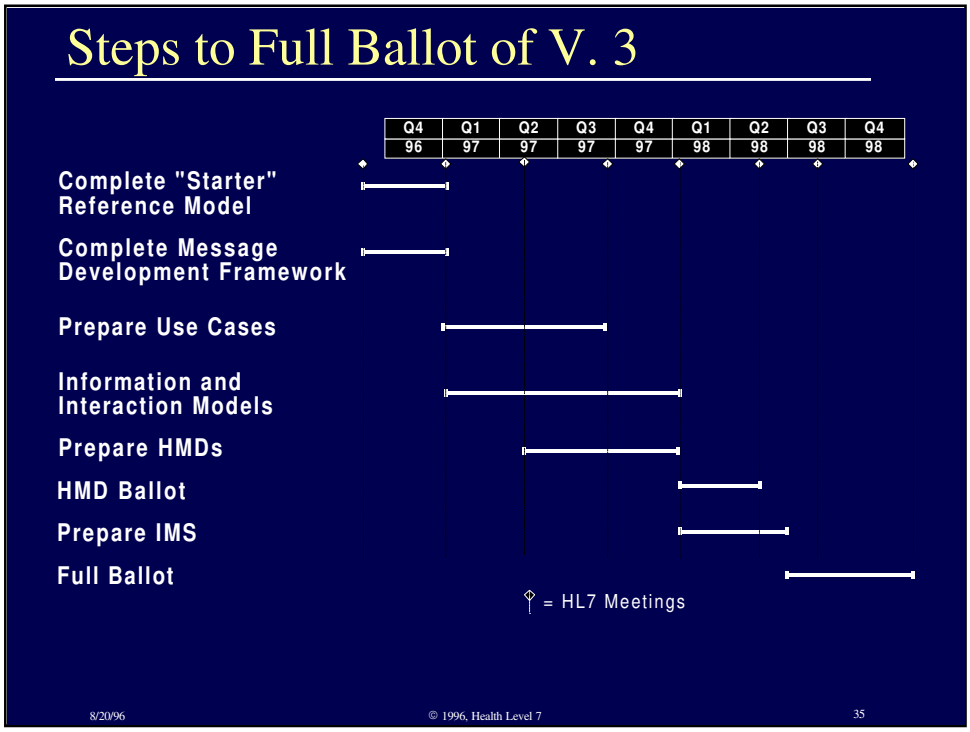
–ER7 is an improved version of the current character stream protocols

–Supports legacy systems

–Supports the culture change

•EDIFACT

–Potential support for our overseas affiliates



•This timeline was developed through group discussions during the Technical Steering Committee meetings, and the TSC voted to accept it as the goals for Version 3 by an overwhelming majority.

•Note assumed iteration among use cases, info model, HMD

•Starter Reference Model

"Call for Models"

Models from TSCs, member orgs, and standards groups

Initial draft presented at this meeting

Complete model intake and consult with TCs before January

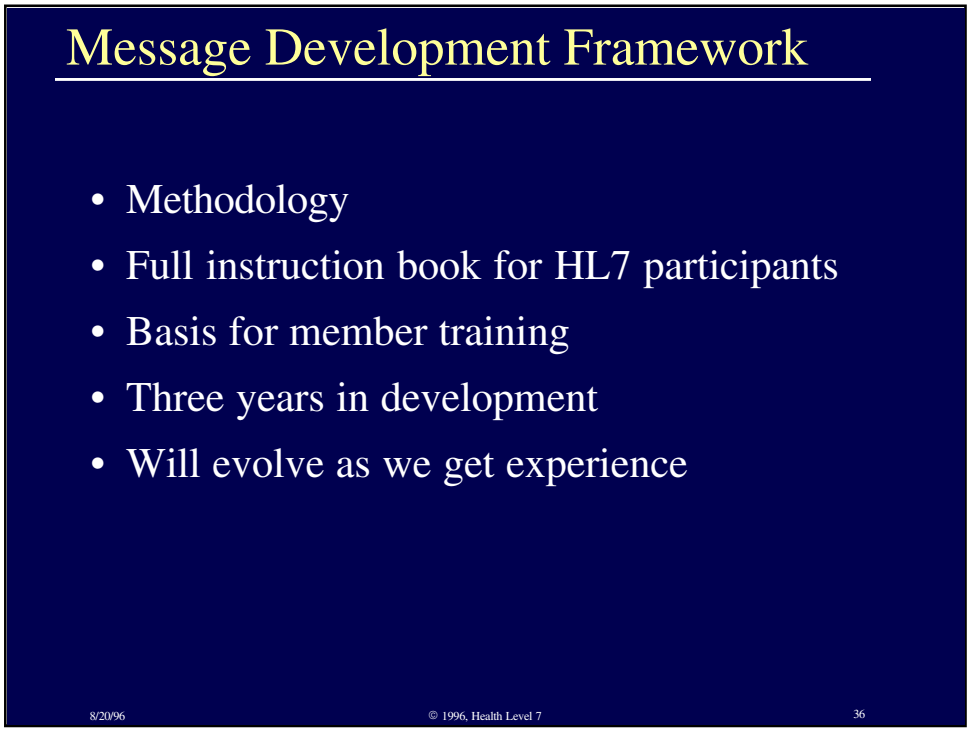
Is a **start** will be modified by TCs through out process

•MDF

All steps documented

Approximately 150 pp. document

Copies of current draft available



training

receiving trial run this week

Inter-version Compatibility

- Evolutionary change a *must*
- HL7 approaches
  - Version 2
  - Version 3
  - Version 2 to Version 3

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Compatibility: Version 2.2 to 2.3

- Applies to all version 2
  - Good news
    - All properly designed 2.x interfaces can interoperate
    - Implemented in encoding rules
  - Bad news
    - Serious constraint on evolution of the plan

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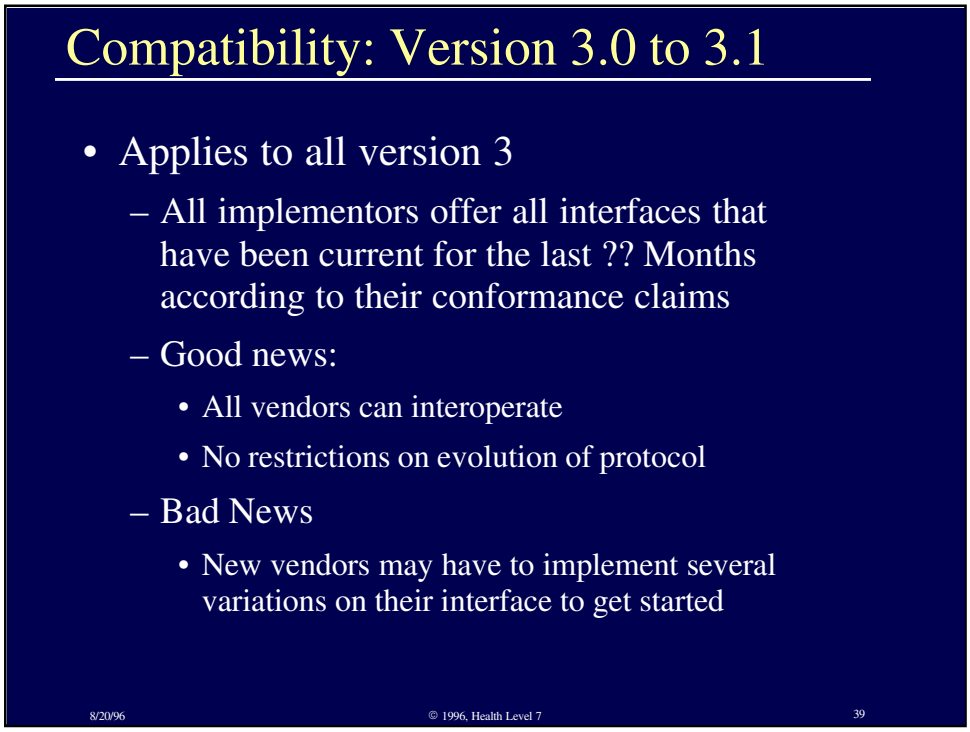

?? months -- 12, 18, 24?

Version 2.3 to 3.0

- Going to a more restrictive standard from a looser
- Versions are ***not*** directly interoperable
- Versions will be translatable via interface engines
- Good news
  - First in 10 years
  - One time
  - 2 years+ advanced warning

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Optionality in Version 3

- "Optional" mostly replaced by "conditional" and "required"
- Some parts of a message can still be optional
- Retain ability to add "Z" segments
- Benefits
  - Allow for recognized and unrecognized differences in practice
  - Allow evolution of the standard

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Benefits of V3 Optionality

- Allow for differences in practice (recognized ***and*** unrecognized)
- Allow evolution of the standard
- Still not anything like the "promiscuous optionality" in version 2

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Optionality vs. Conformance Claims

- A conformance claim is an assertion to send and receive the specific set of messages associated with an Interaction Role
  - at specified trigger events
  - obeying specifications about conditional, required, null
- Provides a consistent, unambiguous vocabulary for pre-contract understanding of vendor capabilities
- Claim does not bind vendors to do optional attributes or Z segments--local negotiation

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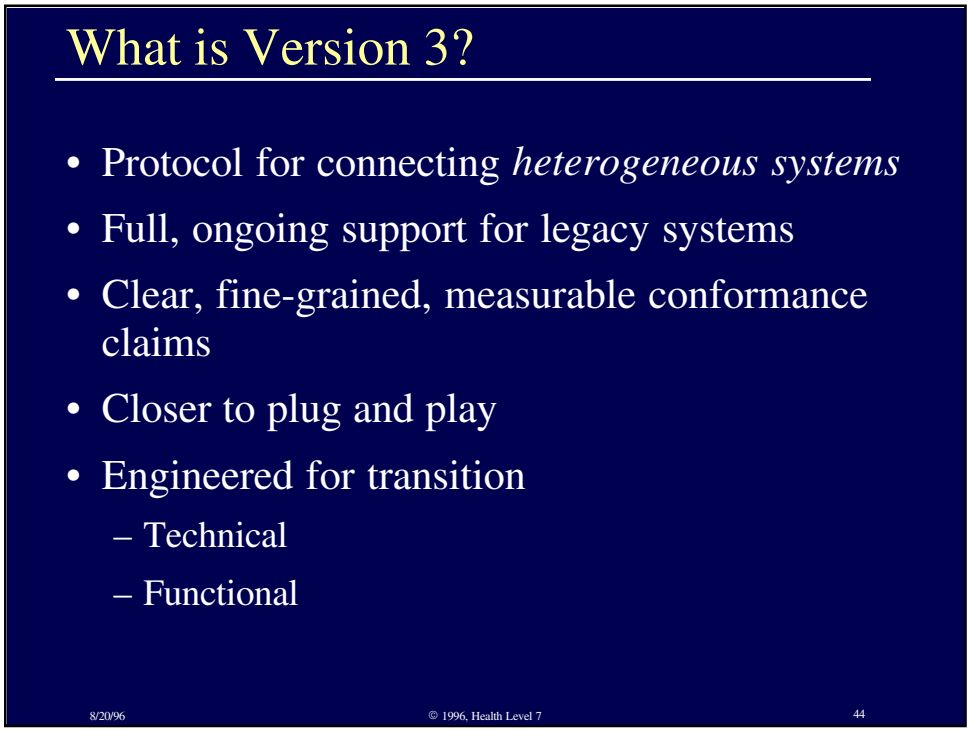

Closer to plug and play

- Less accidental optionality
- More accurate specification of what data is sent when

Engineered for transition

- Technical
  - Legacy to Object
  - Freely available support code
- Functional
  - coverage of old spec in data model
  - coverage of old transactions in new transaction sets

What is Version 3 Not?

- Fully plug and play
- An interoperable transition
- Throwing out the old, starting all over

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Is the Pain worth the Gain?

- Transition costs
  - retooling of character-stream based interface software
  - or, adaptation of object-based approaches, with corresponding benefits
  - Analyst time to interpret 2.3 transactions and configure interface engines for 3.0
- The good news
  - You have a two-year+ head start

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So, What Do *You* Think?

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